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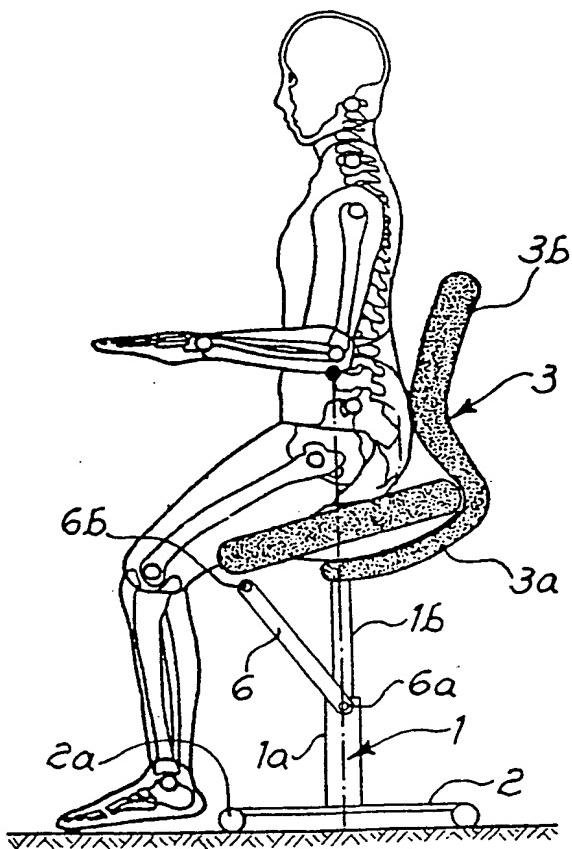
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(54) Title: ERGONOMIC CHAIR HAVING THE SEAT AT A VARYING POSITION

(57) Abstract

An ergonomic chair has its seat portion (4) which, in addition to be adjustable as to the height, forms a variable tilting angle, positive or negative with respect to the horizontal, in consequence of the height thereof, said tilting angle being obtained through a swinging movement of the seat (4) such as to form an arc of circumference about a rotation center substantially coincident with the center of gravity (CG) of a person sitting on the chair. This swinging movement of the seat is preferably accompanied by the rotation of a lever arm (6) pivotally mounted at an end (6a) to the stationary portion (1a) of the seat support (1) and hinged at the other end (6b) to the front side of the seat (4), the length of said lever (6) or the pivoting point with seat (4) being adjustable by a simple operation of the user to modify the variation of the tilting angle of the seat (4) in function of its height. Said lever arm (6) may be provided with some elastic feature.



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"ERGONOMIC CHAIR HAVING THE SEAT AT A VARYING POSITION"

The present invention relates to an ergonomic chair the seat portion of which can change its position for a better adaptation to the users' 5 height and the level of the work table in front of which the user is seating.

It is known that some types of chair for use in an office or the like have a function which allows the height of a seat portion to be freely 10 changed in accordance with the physique of a sitting person, the height of a desk employed and so forth.

Another type of chair is also known in which the angle of its seat portion can be tilted in a certain range toward the front and rear side 15 of the seat portion in accordance with the intention of a sitting person. The function which allows adjustment of the height of a seat portion and the mechanism causing the seat portion to swing in a plane perpendicular to the work surface were devised 20 as a result of a pursuit of a chair which allows a person to sit thereon at a height matching the height of the top plate of a desk or table employed, as well as on which a person can sit comfortably 25 from the viewpoints of ergonomics and hence without experiencing fatigue or assuming any unnatural posture even if he continues to sit for a long time.

Chairs of almost all the conventional types each having a seat portion of different height

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However, in a conventional type of chair which allows adjustment of the height of a seat portion or has a seat portion swingable back and forth, the height of the seat portion can only be adjusted in a state wherein the seat portion is allowed to swing back and forth within a limited range. Accordingly, if the height of the seat portion of such a seat is greatly changed and the seat is combined with desks having top plates which greatly differ from one another in height, a sitting person cannot assume a posture which is desirable from the viewpoints of ergonomics. Accordingly, a chair on which a person can sit comfortably will have to be found out among the conventional chairs and giving up the adjustability in height.

As a matter of fact the swinging axis about which the seat portion swings back and forth is located below the seat portion in any position. Therefore, since the center of gravity of a person sitting on the chair is shifted up and down or back and forth by the swinging motion, it is impossible to avoid changes in position energy and there is a risk of compelling the sitting person to assume an unnatural posture which is not only tiring but also unstable and dangerous.

It is an object of the present invention to provide a chair having a seat adjustable so as to overcome the above-mentioned inconveniences and drawbacks of the prior art and in particular such as to keep the center of gravity of a person sitting thereon as much as possible along a vertical axis

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according to the invention will become clearer on the ground of the following description given by way of a non-limiting example with reference to the drawings in which:

5

FIGURES\_1a-1c are diagrammatic side elevational views showing various postures taken by persons sitting on conventional chairs with a tilttable seat, adjustable as to the height;

10

FIGURES\_2a-2c are diagrammatic side views, similar to the preceding ones, of the positions taken by a chair provided with a seat according to the invention showing also the relationship existing between the seat height and the tilting angle and at the same time the corresponding postures of a person sitting on said chair;

15

FIGURE\_3 shows the silhouette of a person sitting on a chair according to the invention at various heights of the seat but with his feet at the same position;

20

FIGURE\_4 and FIGURE\_5 are diagrammatic side elevational views of two alternative embodiments of the seat portion only of a chair according to the invention;

25

FIGURES\_6a\_and\_6b show two diagrammatic side views, at different heights of the seat, of a chair according to the invention in a preferred embodiment; and

30

FIGURES\_7a\_and\_7b are two diagrammatic side views of the seat portion only of a chair according to Figs. 6a and 6b, each of which shows a constructive possibility of a mostly preferred

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rotation center CR positioned thereunder. Therefore the human sitting will be subject to a sensation of instability which he will unavoidably try to oppose by exerting some muscular force involving  
5 fatigue and discomfort with the passing of time.

For a person sitting on a chair according to the invention, Figs. 2a-2c show, respectively at the same heights of Figs. 1a-1c, that the center of gravity CG of this person in any case remains  
10 on the vertical axis of support diagrammatically indicated with a dashed and dotted line, even at considerable sloping angles of the seat, back or forth, with respect to the average position with horizontal seat of Fig. 2b.

15 This results apparently from Fig. 3 were the overlapping profiles of a person sitting at different heights on a chair according to the invention have been shown with the feet coincident on the same position. The locus described by the center  
20 of gravity CG is a substantially vertical line CGL, without any forward or backward shifts. Every situation is therefore of stable equilibrium.

25 Turning now to Figs. 2a-2c the chair central support will have, as it is known, the function of freely allowing the height to be adjusted, such as by means of gas under pressure, but however while allowing at the same time the rotation of the chair about its vertical axis indicated with a dashed and dotted line. Also a chair base, preferably  
30 with casters, has not been shown as it is of known type, which is provided at the lower end of the

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the weight which is applied to the seat portion decreases. As a reaction, the seat portion is somewhat pushed toward the rear. Therefore, in the case of a chair with casters, it is desirable to provide a 5 caster lock mechanism to be actuated according to the height of the seat.

Fig. 4 is a side elevational schematic view of an example of the swinging mechanism for the seat relating to the chair of the present invention, in which the same reference numerals of the other figures denote the same members, in particular 10 the portion 3a of the supporting member 3 being formed as a portion of an arc which is drawn about a center of rotation ideally coincident with the 15 average location of the center of gravity CG of the persons using the chair. Like in Figs. 2a-2c reference numeral 4 denotes a seat portion which is carried on said portion 3a of the supporting member 3 and the lower surface 4a of the seat portion 20 is formed in accordance with a curvature which is equal to the curvature of the portion 3a of the supporting member 3. Specifically, the seat portion 4 is carried on the supporting member 3 like on an arc-shaped guide in such a manner that it can swing 25 in the opposite directions indicated by arrows in the drawing. Also the vertical support 1 has been illustrated here, which is provided with a vertical adjustment mechanism, although not shown, which allows adjustment of the height of the seat-portion 30 supporting member 3 as it is known. This vertical support 1 is centrally mounted on a chair base 2,

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such as by being telescopically mounted for an axial movement within the stationary portion 1a to which it is lockable at each desired position in whichever known manner. The other end 6b of lever 5 6 is pivotedly mounted to the front portion of the seat 4. The user of the chair according to the invention provides for adjusting the height of seat 4 according to his own height and the level of the working surface in front of him, while at 10 the same time the tilting angle of the seat 4 is automatically adjusted to assume the most comfortable position at this given height of the seat and maintains this particular angle without further swinging movements.

15 According to a more preferred embodiment of the present invention, with reference to Figs. 7a and 7b, the length of said lever 6 is not fixed but it is also adjustable for having more possibilities of postures which the user can obtain for a maximum 20 comfort. In the example of embodiment of Fig. 7a the lever 6 is connected to the seat portion 4 through an additional lever 7 to which it is hinged in 6b. As the angle comprised between levers 6 and 7 varies, such as in function of the user's height, 25 or arbitrarily, the practical consequence is that also the distance changes between the stationary pivot point 6a and the pivot point to the lower surface of the seat 4, in other words the tilting angle of the seat while the height is the same. 30 Fig. 7b schematically shows an alternative embodiment in which the different length of lever 6 is obtained

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This in particular when adopting the preferred solution of rendering adjustable at will, especially according to the user's height, the way of varying the seat tilting angle in function of the height  
5 thereof.

Possible additions and/or modifications can be made by those skilled in the art to the above-described and illustrated embodiments of the chair according to the invention without departing  
10 from the scope of the invention itself. In particular there could be provided changements relating to the backrest portion of the chair, such as to modify for example also its slope with respect to the seat support according to the height of the latter.

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along which part said seat portion (4) can move.

4. A chair according to claim 2, characterized in that said seat portion (4) is supported on at least one side by a suspending arm (4c) which 5 extends upwardly as it is hinged at an upper end (4b) substantially coincident with the said point (CG) to an associate side upright support (31).

5. A chair according to claim 2, characterized by further comprising a lever arm (6) hinged at 10 an end (6a) to said stationary portion (1a) of the central support (1) and at the other end (6b) to said seat portion (4) near the front side thereof, whereby a predetermined tilting angle of the seat (4) corresponds to the given height of the latter.

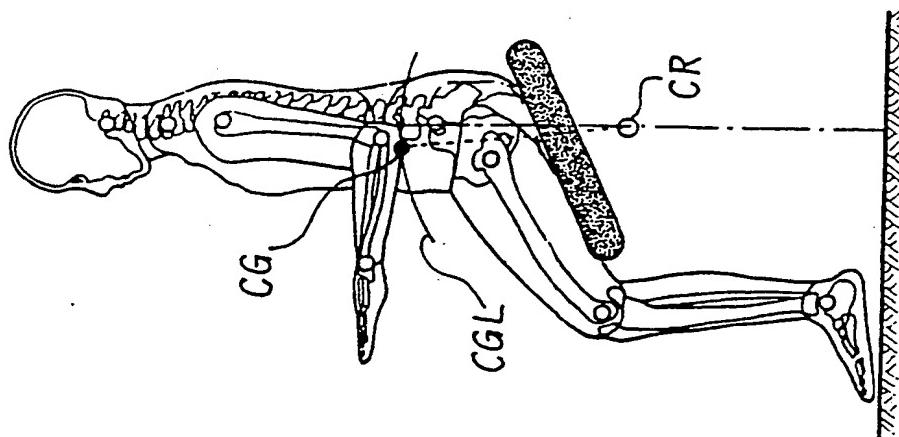
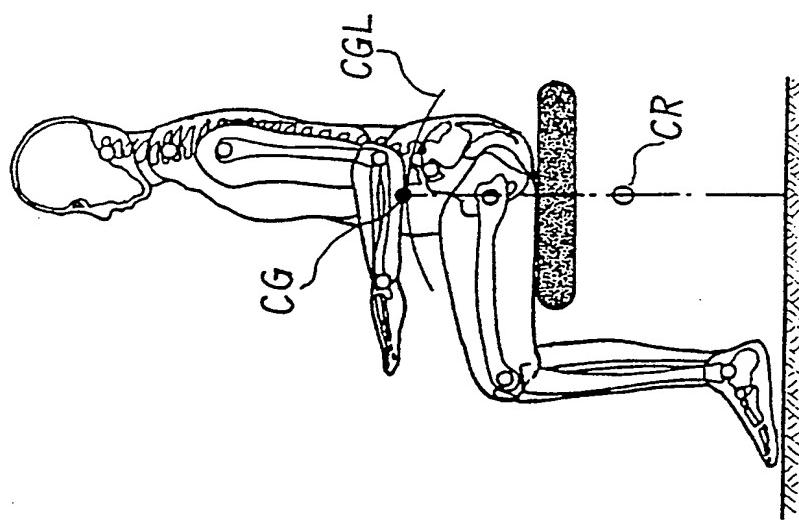
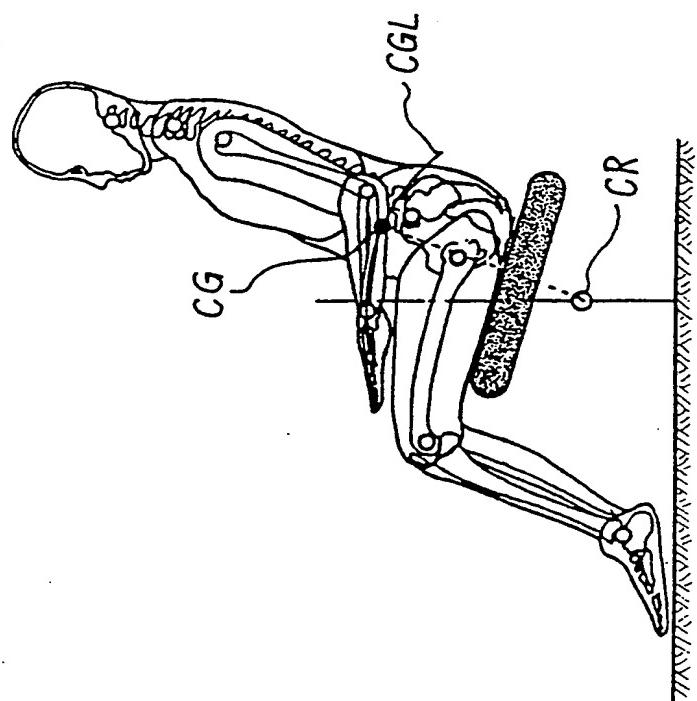
15 6. A chair according to claim 5, characterized in that said lever arm (6) has a variable length, adjustable at will, whereby the law can be changed according to which the tilting angle of said seat (4) varies as a function of its height.

20 7. A chair according to claim 6, characterized in that said lever arm (6) is connected to the seat (4) through an additional lever (7) to which said lever (6) is hinged in (6b), the angle between lever (6) and (7) being fixable at will.

25 8. A chair according to claim 6, characterized in that said lever (6) at the end opposite to the one pivoted in (6a) is formed with an elongated slot (8) within which said pivot point (6b) can be fixed at will.

30 9. A chair according to claim 5, characterized in that said lever arm (6) is made of a material

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Fig.1cFig.1bFig.1a

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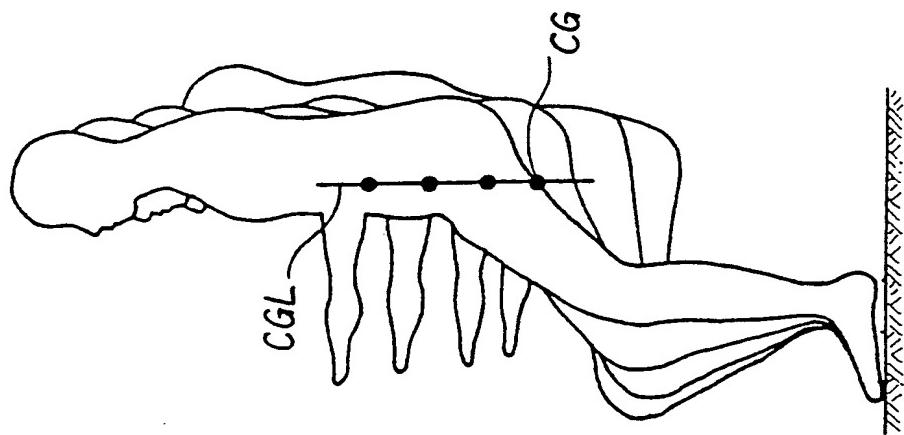
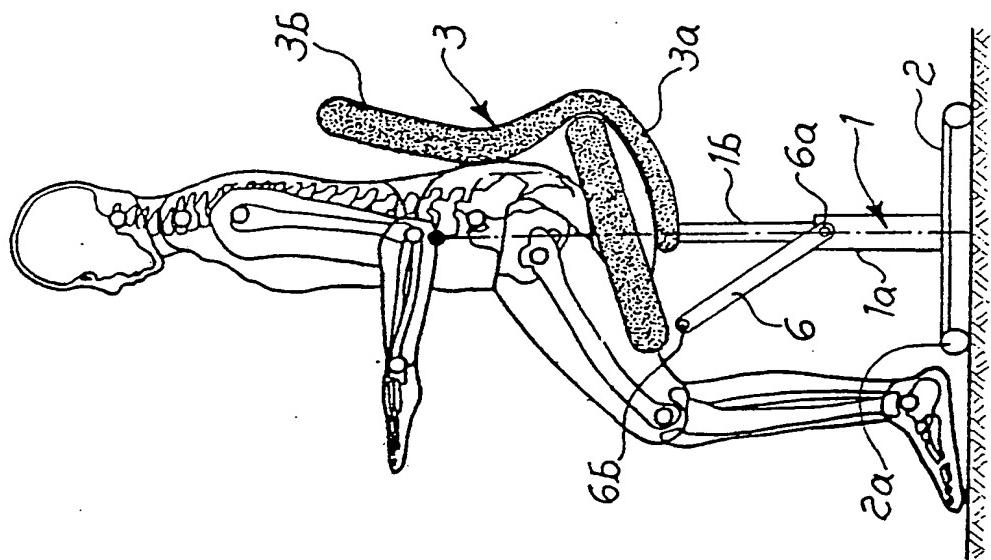
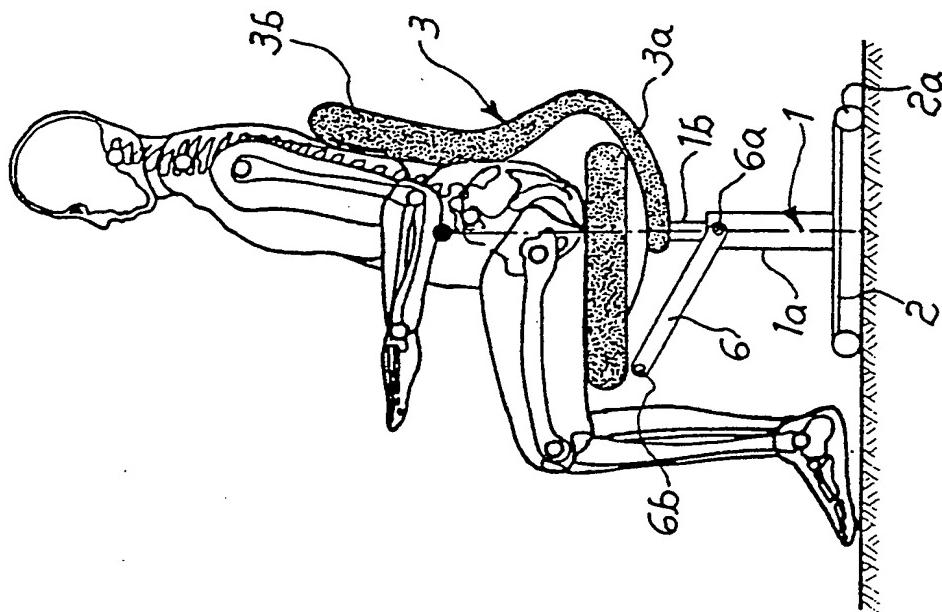
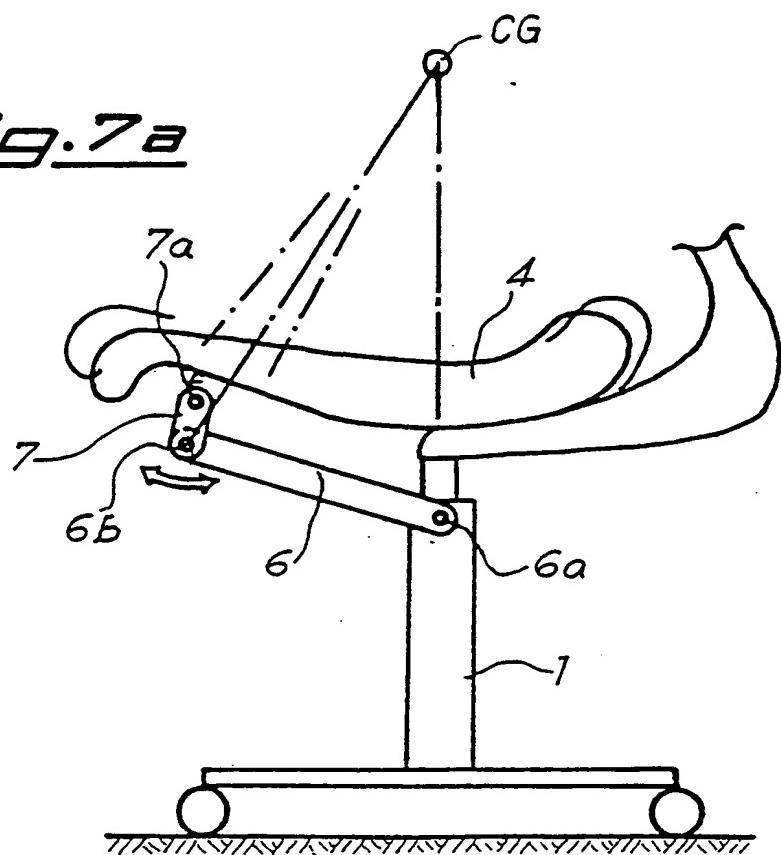
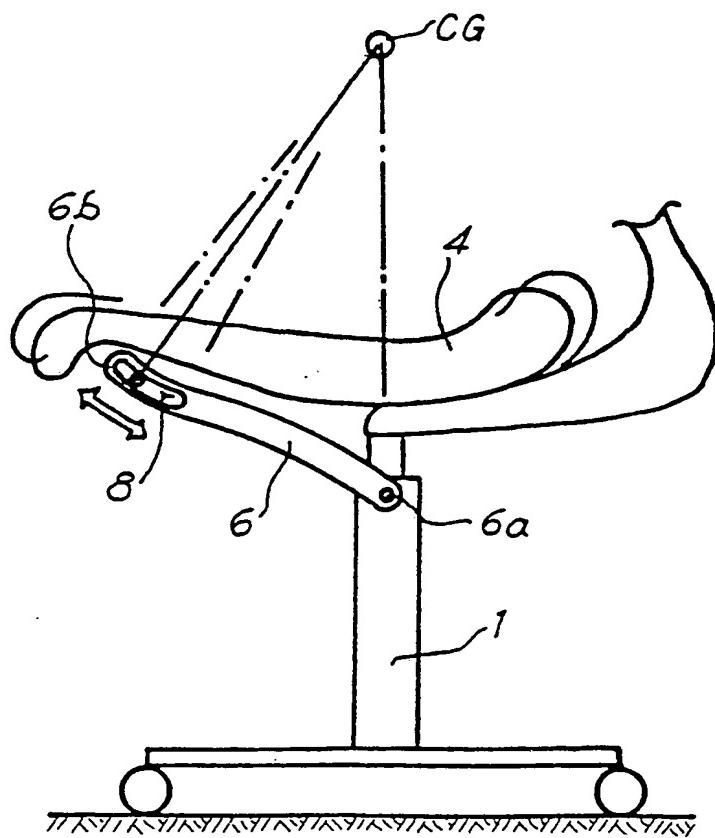
Fig. 2Fig. 6bFig. 6a

Fig. 7aFig. 7b

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.**

IT 8800088  
SA 26241

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR-A- 958120		None	
EP-A- 0250207	23-12-87	None	